

or a house, would remain untouched, while to the east or west everything would be swept clean. In some places an upward and downward curve could be detected in its course; here a mass of trees were leveled to the ground, and there a cluster with only their tops broken off. Reports from Bulloch county show the tornado to have passed over a portion of that county, sweeping nearly everything in its path. At Sandersville, Ga., on the 27th, a tornado passed over the county about 11 a. m., causing much destruction. A number of persons were seriously injured by the blowing down of houses. A school house, at Whidden settlement, was blown down, the teacher and several children were injured. With the exception of the destruction of some fencing and shade trees, Sandersville escaped. At Raynesboro, Ga., 27th, a destructive wind swept over the county, four or five miles northeast of this place. Within the path of this storm a house was blown to pieces, killing one child. No other personal injury is reported, although houses are said to have been destroyed on every plantation within its course. All the public roads are seriously obstructed by fallen trees. Macon, Ga., 27th, a tornado did considerable damage to property near here, and along the railroad as far as Sandersville, dwellings, barns, gin-houses, cabins, and trees were destroyed. No fatal accidents are reported. The tornado was very violent and its track was about a thousand yards wide; it moved from west to east.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for March, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 86.66 per cent. The percentages for the four elements are: Weather, 81.91; Direction of the Wind, 83.33; Temperature, 90.46; Barometer, 90.86 per cent. By geographical districts they are: For New England, 86.56; Middle Atlantic states, 89.89; South Atlantic states, 86.36; East Gulf states, 83.77; West Gulf states, 81.92; Lower Lake region, 89.06; Upper Lake region, 88.59; Tennessee and the Ohio valley, 91.36; Upper Mississippi valley, 86.43; Lower Missouri valley, 80.48; Northern Pacific coast region, 81.94; Middle Pacific coast region, 93.14; Southern Pacific coast region, 93.14.

There were 88 omissions to predict (31 being due to the absence of reports from the Pacific coast) out of 3,813, or 2.30 per cent. Of the 3,725 predictions that have been made, 143, or 3.84 per cent., are considered to have entirely failed; 148, or 3.98 per cent., were one-fourth verified; 395, or 10.60 per cent., were one-half verified; 207, or 5.56 per cent., were three-fourths verified; 2,832, or 76.02 per cent., were fully justified, so far as can be ascertained by the tri-daily reports.

CAUTIONARY SIGNALS.

One hundred and seventy-four Cautionary signals were displayed during the month of March, of which 162, or 93 per cent., were justified by winds of twenty-five miles per hour, at, or within, 100 miles of the station. Sixty-four "Off-shore" signals were displayed, of which 55, or 86 per cent., were fully justified; 58, or 90 per cent., were justified as to direction; and 61, or 95 per cent., were justified as to velocity. Two hundred and thirty-eight signals of all kinds were displayed, of which 217, or 92 per cent., were justified. Twenty-five Cautionary signals were changed to "Off-shore" signals. The above does not include signals ordered at sixty-nine display stations, where the velocity is estimated only. Twenty-nine signals were reported late.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the table on the right-hand of chart iii., are given the highest and lowest stages of water, as observed at Signal Service

stations, during the month of March. At stations on the Mississippi it will be seen that the water remains above the danger-line at Cairo and Vicksburg, and is only four inches below the danger-line at Memphis. The readings of the highest water during the month at stations on the lower Mississippi, were as follows:

Cairo, fifty-one ft., on the 1st, or eleven feet above the danger-line. Memphis, thirty-six ft., on the 6th, 7th, 9th. Vicksburg, forty-eight ft., nine ins., on 20th, or eight ft., nine ins., above the danger-line. The highest at New Orleans, occurred on the 27th, when it was but five inches below the high-water mark of 1874. The Red river was highest at Shreveport on the 10th, 11th, 12th, when it was thirty-one feet one inch, or one foot above the danger-line; it was lowest on the 31st. The Ohio river rose during the latter part of the month, but did not reach the danger-line; it was highest at Cincinnati on the 25th, at Louisville on the 26th, at Pittsburgh, on the 22d. The Cumberland was highest at Nashville on the 11th and 13th, when it was three feet nine inches above the danger-line. The upper Mississippi rose slowly during the month, between La Crosse and St. Louis, and was highest at Keokuk and Davenport on the 31st.

ICE IN RIVERS AND HARBORS.

Hudson River: Albany, 1st, ice broke up in river; 3d, river free of ice. First steamer of season left this city for New Baltimore, to-day; 5th, river free of ice from Troy to New York; navigation practically open for this season; 10th, first arrival by river from New York. New York City, 9th, navigation opened; first steamer from Troy arrived to-day.

Mohawk River: Albany, 1st, ice broke up in river and passed this city this evening.

Connecticut River: Springfield, Mass., 2d, floating ice in river. 3d, river clear of ice.

Genesee River: Rochester, 28th, first boat of season arrived to-day.

Detroit River: Detroit, 2d, ice along shore in river; 13th, steamer "City of Detroit," left for Cleveland; first departure of season.

Lake Erie: Buffalo, 26th, the propeller "New York," arrived from Cleveland; the earliest arrival for many years.

St. Lawrence River: Cape Vincent, N. Y., 3d, ice breaking up and going out of river and lake at this place.

Lake Superior: Marquette, 3d, ice moved out of harbor; 4th, ice moved back into harbor. Duluth, Minn., 1st, all ice went out into the lake during the night; 4th, ice driven back during the evening; 5th, lake filled with ice; 10th, ice moved out about one-fourth mile; 18th, ice moved out about one-half mile; navigation resumed; tugs with freight and passengers left for northern ports; 20th, ice driven back again, damaging the old breakwater.

Lake Michigan: Milwaukee, 8th, navigation practically open. Northport, 31st, no ice to be seen in lake; navigation fairly open.

Manitowoc River: Manitowoc, Wis., 4th, ice broke in river; 7th, river frozen; 15th, river open.

Lake Huron: Alpena, 2d, ice broken in bay and river; navigation open. Port Huron, 23d, steamer "Flora," left city this a. m. for northern ports; the earliest departure for years.

Yellowstone River: Fort Buford, Dak., 29th, ice broke in river at 10 p. m. Fort Keogh, Mont., 28th, river open. Terry's Landing, 25th, river open; 26th, ice gorged in shallow places. Foley, Montana, 28th, ice broke in river during night. Iron Butte, 29th, ice broke in Upper Yellowstone to day, sweeping out about 100 feet of Northern Pacific Dyke.

Mississippi River: Burlington, 4th, navigation opened; first boat of season passed city at 5.45 p. m.; 11th, first passenger steamer from St. Louis touched this city on her upward trip to La Crosse. Keokuk, 6th, navigation open; first raft of season passed to-day; 18th, first northward bound steamer passed to-day. La Crosse, 3d, river opened; 4th, navigation resumed; steamer arrived from Fountain City; ferry boats making regu-

lar trips. St. Paul, 9th, ice broken in places; 23d, ice breaking up in river and moving down stream; 24th, ice gorge in river; 26th, ice gorge at 6.30 p. m.; 27th, 29th, river full of floating ice.

Missouri River: Yankton, 4th, ice broke in river; 8th, river frozen; 17th, ice broke in river. Leavenworth, 9th to 12th, slush ice in river; 13th, river clear of ice; 26th, steamer "Red Cloud" from St. Louis to Fort Benton passed to-day.

Tongue River: Fort Keogh, Mont., 25th, ice broke in river.

Powder River: Foley, Montana, 24th, ice broke in river at eight a. m.

Cobossee River: Gardiner, Me., 28th, a. m., ice started from mouth of river above the bridge. 29th, river clear of ice to cove $1\frac{1}{2}$ miles below the bridge.

FLOODS.

The excessive rainfall in the central Mississippi and Ohio valleys and in Tennessee, during the month, has caused a continuation of the damaging floods, especially in the Mississippi valley south of Cairo. At this station the water was fifty-one feet on the gauge on March 1st. This is eleven feet above the danger line. The observer at that station reports that the Mississippi and Ohio remained above the level in places until March 2d. After that they began to recede from the top of the city's embankments. An overflow was prevented only by the construction of a bulk-head on the top of the levee, and extending it around the city. This bulk-head was constructed by driving short stakes into the earth at intervals of six feet, and nailing planks to the uprights. Against this an embankment of earth was thrown on the side from the river. The sipe-water referred to in February report continued to rise until the 22d, when it reached its maximum, the highest ever known, almost the whole city being under water. On the 27th of March, the water had fallen to forty-one feet and one inch on the gauge, and was low enough to permit of the opening of the sewers. The damage done in the inundated region is much greater than was at first estimated. All railroads leading from the city were under water; passengers leaving the city were compelled to take passage in boats in order to reach the trains. About four thousand sufferers in Alexandria and Pulaski counties have received rations issued by the government. The observer at Memphis reports, on the 6th, the river is thirty-six feet above low water of 1872, which is the highest on record; 7th and 9th, river thirty-six feet; 10th, river falling slowly. Reports indicate that the present flood in the lower Mississippi is more extensive and destructive than the floods of 1862, '67 and '74. The river ranges from ten to twenty miles in width from Cairo southward to New Orleans; but the region of greatest damage lies between Vicksburg and Memphis. The observer at Vicksburg reports: 12th, river rising; levee on Louisiana side of river opposite station and protecting Delta, La., is in imminent danger of being broken; 13th, river rising; much distress reported from Yazoo and Sunflower valleys above station; entire country overflowed; 14th, river very high; lower Levee street under water; refugees from overflowed districts arriving in city; 15th, river still rising; levee on opposite side of river gone; break one hundred and fifty yards wide; a few houses were swept away. The river reached its maximum height, forty-eight feet, nine inches on the 20th; 21st, river falling. Reports from White river, Clarendon, Ark., state that the back water from the Mississippi extends to a distance of a hundred and thirty-five miles, and that the entire country intervening is under water. The river is two feet higher than was ever known before. The river reached its highest point at New Orleans on the 27th, when it was five inches below the high water mark of 1874.

The overflow in Concordia parish extends from the Black to the Mississippi rivers, a distance of thirty-five miles; in Tensas parish, from Tensas river and Bayou Macon to the Mississippi river, a distance of thirty miles; in Franklin parish, from Tensas west to the Ovachita river, a distance of ten miles; in Madison parish from Bayou Macon to the Mississippi

river, a distance of thirty-five miles; in East Carroll parish from Bayou Macon to the Mississippi river, ten miles. The flood extends to the Ovachita river, a distance of fifteen miles. The Tensas river, since Saturday, has risen five feet, and is still rising at the rate of eleven inches in twenty-four hours. Along the Tensas and Bayou Macon the water is three feet higher than in 1875, and the unprecedented flow is accounted for by the breaks in the levees at Milliken's Bend and Goodrich Landing. Natchez, Miss., 24th, reports from the Tensas river and its tributaries are more distressing every day. The water is two and a half feet higher than in 1874, and is rising at the rate of five inches in twenty-four hours. Reports from Yazoo City, 15th, state that the water rose in the river six and a half inches in the past twenty-four hours, while the backwater is rising more rapidly. The current of the Yazoo is running up stream to Sattartia, twenty-four miles below here. Greenwood, two hundred miles above here, is covered with water, and the last boat brought the news that the citizens, white and black, were taking refuge on the second floor of the court-house. Greenwood was not covered by the overflow of 1867. Reports from Fort Adams, Miss., 15th, state that there has been for several weeks a continued rise of the river at this point, of from three to four inches every twenty-four hours, up to Sunday, the 12th instant, when it reached the high-water mark of 1874. Since then the rise has been partially checked, being only one inch in the last twenty-four hours. The river is now about four inches above the high-water mark of 1874. The prospects for crops in the hills are not as promising as they might be. Work is very backward, owing to the continued rains. Farmers have had but very little good weather to prepare for planting, and the general outlook is rather gloomy. A despatch from Yazoo City on the 18th makes the startling announcement that the water at that point is higher now than in 1867. Following the course of the river the distance from Vicksburg to Coldwater, is about four hundred and fifty miles. The entire country contiguous is swamp lands. In width it is probably sixty miles, and this is known as the Yazoo Delta, which is bounded on the east by the hills and on the west by the Mississippi river. The low-lands are entirely submerged, with the exception of a few knolls or Indian mounds at long intervals, on which the stock and people are gathered where they are accessible.

The rains, together with the unusual volume of water from the Mississippi river flowing through the breaks into the tributary streams, the principal of which are the Coldwater, Tallahatchie, Yazoo, Sunflower, Big and Little Deer creek, and many others of less note have caused them to be swollen beyond precedent. In the meantime the people are totally unprepared to protect themselves or property, hence the losses are simply beyond estimate. Loss of life has not been large, but the loss of cattle and stock and provisions, agricultural implements pertaining to culture of cotton has been great beyond comparison. Reports from Helena, Ark., on the 18th, state that the destitution now prevailing in the sunken lands of the upper St. Francis was never equalled. The Tyronga, a small river running out of the St. Francis, with Little river and other points are thickly settled with whites, who are on rafts, scaffolds and logs. Families are huddled together like animals, praying for food. For a distance of three hundred miles, no land is to be seen. The river continues falling at Helena, but the overflows in the city remains about the same. Captain Gordon Webster, of Indian Bay, Ark., one hundred miles up White river, arrived at Memphis on the 7th, and reports as follows: The water there is thirty-five inches higher than ever before; this is attributed to the backwater from Helena, a large volume of which rushes across the low country and assists in filling the whole intervening swamps. Indian Bay is deserted by all except one family, who are encamped on Indian mounds, others having sought quarters on the bluffs of St. Charles or adjacent hills. More than half of the stock belonging to the people of Monroe county has been lost, and from five to six

hundred residents are destitute and need immediate assistance. Several fields of recently planted corn are covered with from nine to twelve feet of water. Reports received from Lake Providence, La., 25th, state that the break in the levee at Alsalia, below Lake Providence, widens; there are three breaks between Alsalia and Goodrich's Landing, and four between Goodrich's and the Raleigh Place. The breaks are from one hundred to eight hundred yards wide, and increasing. The country from Melbourne down is all under water to depths from six to eight feet; it extends back for miles. There has been an immense loss of stock and household goods. No attention was paid to saving property when the break occurred, as it was a matter of life and death. It required every effort to save human life. The whole day is being spent in rescuing people. Many are in danger for want of boats to rescue them. Several children and men were drowned. The loss of life and property cannot be ascertained. Helena, Ark., 25th, river fell two inches to-day and the overflow in the city is about the same. Lieutenants Satterlee and Richards, detailed by the Secretary of War to examine into the condition of affairs here, report much destruction below and in the interior. The Ohio river reached its highest point at Cincinnati on 25th, when it was three feet below the danger-line or forty-seven feet on the gauge. The observer at Cincinnati, on the 20th, reports very heavy rains, causing rivers and streams to rise suddenly. Several coal barges broke from their moorings and a number of small bridges were carried away. The Cumberland river, at Nashville, was forty-five feet nine inches on the gauge from the 11th to 13th, or three feet nine inches above the danger-line. The observer at that station reports on the 6th, river rose fourteen feet four inches in twenty-four hours; 9th, river rose six feet four inches in twenty-four hours, and is seven inches above the danger-line; no damage reported; 10th, river three feet five inches above the danger-line. The river continued at this point above the danger-line until after the 15th. The heavy rains in northern Alabama, between the 6th and 10th, caused the Tennessee to overflow its banks near Chattanooga, resulting in considerable damage to railroad embankments. The Red river, at Shreveport, was highest on the 10th, 11th and 12th, where it was thirty-one feet one inch on the gauge, or one foot four inches above the danger-line.

HIGH TIDES.

Boston, 19th; New Shoreham, R. I., 18th; Delaware Breakwater, 19th; Little Egg Harbor, N. J., 17th, 18th; Flushing, N. Y., 16th.

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors at Signal Service stations, with the average depth at which the observations were taken, is given in the table on the right hand of chart ii. Observations on temperature of water were not taken on the following dates and at the following stations on account of ice in harbors: Milwaukee, 1st to 6th; Detroit, 2d; Duluth, 5th to 31st; Alpena, 1st; Marquette, 1st, 2d, 4th to 31st; Escanaba, frozen throughout the month; Burlington, Vt., lake frozen throughout the month. It will be seen that the mean of the maximum and minimum temperatures of water, correspond very nearly with the temperature of the air at the stations, as indicated by the isothermal lines on chart ii.

ATMOSPHERIC ELECTRICITY.

AURORAS.

The most widely observed display occurred on the 19th. This remarkable display was observed by stations along the northern boundary of the United States, from Eastport to Oregon, and was reported by the various stations as follows: Eastport, Me., 10.30 p. m. to midnight, faint light in northern sky, extending from northwest to northeast, and to an altitude of 20°; Gardiner, Me., 10.30 p. m. to 3.45 a. m. of 20th, very bright, with beams moving rapidly from east to west; Burlington,

Vt., 10 to 11.45 p. m., very brilliant with dark segment low down upon the horizon, bright arch, streamers shooting up to a height of from 20° to 45°, and of greenish color; Boston, 9.30 p. m. to 4 a. m., of 20th, faint auroral band along the horizon, extending 60° azimuth. At 2 a. m. it became very brilliant, with streamers shooting up to an altitude of 30° and moving slowly along the horizon from west to east; Springfield, 11.18 p. m., very faint, consisting of a slight glow and a few faint rays attaining an altitude of 10°. At 2 a. m. it was somewhat brighter, with an occasional faint ray; Albany, 20th, 12.10 a. m., pale yellow auroral light in northern sky; streamers observed at 12.25 and 2.10 a. m.; the sky, bordering the upper limit, was intensely dark; no dark segment beneath; still visible at 3.45 a. m. Harvard College, Cambridge, Mass., first noticed at 9.15 p. m. as a low, faint arch, streamers appeared soon after and were still visible at 11 p. m. Point Judith, R. I., 8 a. m. to midnight, faint auroral light in northern sky. Fall River, Mass., 10 p. m., aurora mainly in the northwest with a few streamers about 30° in length. Rowe, Mass., 10.30 p. m., North Volney, N. Y., 9.15 p. m., faint auroral light in northern sky. Ithaca, N. Y., first observed at 9 p. m. as a broad arch of light on northern horizon; at 10 p. m., beams extended upward to a height of 20° and soon disappeared; very faint at 11 p. m. Newport, Vt., during evening. Palermo, N. Y., very bright during evening. Rochester, N. Y., first observed at 9.30 p. m.; maximum brilliancy at 11.45 p. m.; arch of pale yellow 20° in height with an unusually low dark segment; disappeared at daybreak on the morning of 20th. Madison Barracks, N. Y., during evening. Oswego, 19th, 9.45 p. m. to 2 a. m. of 20th, consisting of dark segment surmounted by a diffuse light extending half way to the zenith; very bright at 1 a. m., in northeast with beams extending upward to an altitude of 80°. Alpena, Mich., 9.15 to 11.35 p. m. consisting of a diffused light with a few small streamers. Marquette, Mich., 8.20 p. m., aurora of pale yellow color, with beams having a quick lateral motion reaching an altitude of 45°; disappeared at 10 p. m. Northport, Mich., 8 to 10.30 p. m., extending from northwest to northeast with an arch about 30° in height and bright beams 40° in height. Fort Brady, Mich., 8 p. m., fine auroral display. Northfield, Minn., from dark until 7.30 p. m. Terry's Landing, Mont., during evening. Umatilla, Or., 8.55 to 10 p. m., presented a very bright and luminous appearance, but was partially obscured by clouds. Dayton, Wash. Ty., from 9.10 to 9.35 p. m., when display was obscured by clouds; it consisted of a pale white light. The next in importance was the display of the 8th, which was reported by numerous stations from Eastport, Me., westward to Bismarck, Dak., and southward to Fort Myer, Va. At many of the stations reporting, the displays were very brilliant and in some instances continued from early evening until the morning of the 9th. Displays of less importance occurred on the 10th, 14th, 15th, 18th, and 20th. At Burlington, Vt., a faint aurora was observed from 10 to 11.45 p. m. of the 4th; at Manitowoc, Wis., from 8 to 8.30 p. m. aurora with beams in northwestern sky; and at Ruggles, Ohio, on the 30th.

ATMOSPHERIC ELECTRICITY INTERFERING WITH TELEGRAPHIC COMMUNICATION.

Castroville, Tex., 6th, 7.32 p. m., a flash of lightning damaged the lightning arrester by burning the points. The report of thunder, which was very heavy was preceded by a sound resembling the discharge of a pistol. Bismarck, Dak., 19th. Rapid City, Dak., 4th, atmosphere so charged with electricity as to necessitate the cutting out of instruments. Fort Sully, Dak., 5th. Deadwood, Dak., 4th, a severe electric storm raged among the hills and on the plains. At times an electric charge would enter the office and appear as large luminous balls on the switch-board binding-screws. About 4.30 p. m., while the line was uninterrupted and working well, a peculiar hissing noise was audible for a few seconds, followed immediately by a loud crash, when the entire switch-board was enveloped in flames. No damage was done to the